

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims regarding the present application.

Claims

- 1 1. (Currently amended) An apparatus for processing a semiconductor wafer, comprising:
2 a. an upper element;
3 b. a lower element, wherein the upper element and the lower element are configured
4 to be brought together to form a processing volume; and
5 c. a seal energizer configured to maintain the upper element against the lower
6 element to maintain the processing volume, the seal energizer configured to
7 control a sealing pressure in a seal-energizing cavity that varies non-linearly with
8 a processing pressure generated within the processing volume.

- 1 2. (Original) The apparatus of claim 1, wherein the seal energizer is configured to minimize
2 a non-negative net force against one of the upper element and the lower element above a
3 threshold value, the net force following the equation $P1 \cdot A1 - P2 \cdot A2$, wherein P1 equals
4 the sealing pressure, P2 equals the processing pressure, A1 equals a cross-sectional area
5 of the seal-energizing cavity, and A2 equals a cross-sectional area of the processing
6 volume.

- 1 3. (Original) The apparatus of claim 2, wherein the seal energizer is configured to maintain
2 a difference $P1 - P2$ substantially constant during a processing cycle.

- 1 4. (Original) The apparatus of claim 1, wherein the seal energizer comprises a first cavity
2 and the seal-energizing cavity, the first cavity coupled to the seal-energizing cavity, the
3 seal energizer configured so that a first pressure generated within the first cavity generates
4 a second pressure in the seal-energizing cavity larger than the first pressure.

- 1 5. (Original) The apparatus of claim 2, wherein the cross-sectional area A1 is larger than the
2 cross-sectional area A2.

- 1 6. (Original) The apparatus of claim 1, further comprising a means for generating
2 supercritical conditions coupled to the processing volume.
- 1 7. (Original) The apparatus of claim 6, further comprising a CO₂ supply vessel coupled to
2 the processing volume.
- 1 8. (Original) The apparatus of claim 1, wherein the upper element and the lower element
2 form a supercritical processing chamber.
- 1 9. (Original) The apparatus of claim 1, wherein the seal energizer comprises a hydraulic
2 piston coupled to the lower element and configured to maintain the processing volume.
- 1 10. (Currently amended) An apparatus for processing a semiconductor wafer, comprising:
2 a. an upper element;
3 b. a lower element, wherein the upper element and the lower element are configured
4 to be brought together to form a processing volume; and
5 c. means for maintaining a seal between the upper element and the lower element to
6 maintain the processing volume, the means for maintaining a seal configured to
7 control a sealing pressure in a seal-energizing cavity that varies non-linearly with
8 a processing pressure generated within the processing volume.
- 1 11. (Original) A method of maintaining a processing volume, the method comprising the
2 steps of:
3 a. generating a processing pressure within a processing volume; and
4 b. controlling a sealing pressure to form and maintain a processing volume, wherein
5 during a processing cycle the sealing pressure is varied non-linearly with the
6 processing pressure.
- 1 12. (Original) The method of claim 11, wherein the sealing pressure is related to the
2 processing pressure by the equation $\Delta F = P1 \cdot A1 - P2 \cdot A2$, wherein P1 equals the sealing
3 pressure, P2 equals the processing pressure, A1 equals a cross-sectional area of a seal-

energizing cavity, and A2 equals a cross-sectional area of a processing volume, and the sealing pressure is varied to maintain ΔF above a threshold value.

13. (Original) The method of claim 12, wherein a cross-sectional area of the processing volume is smaller than a cross-sectional area of the seal-energizing cavity.

14. (Original) The method of claim 11, wherein the step of generating a processing pressure comprises containing a high-pressure processing fluid in the processing volume.

15. (Original) The method of claim 14, wherein the high-pressure processing fluid comprises supercritical carbon dioxide.

16. (Original) The method of claim 12, wherein the step of controlling a sealing pressure comprises generating a hydraulic pressure in the seal-energizing cavity.